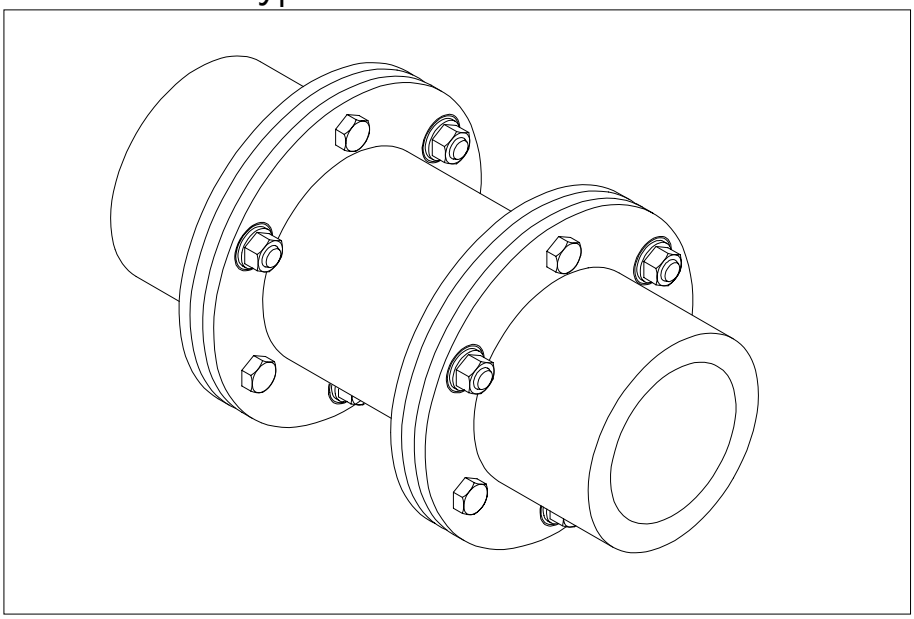
Operating Instructions

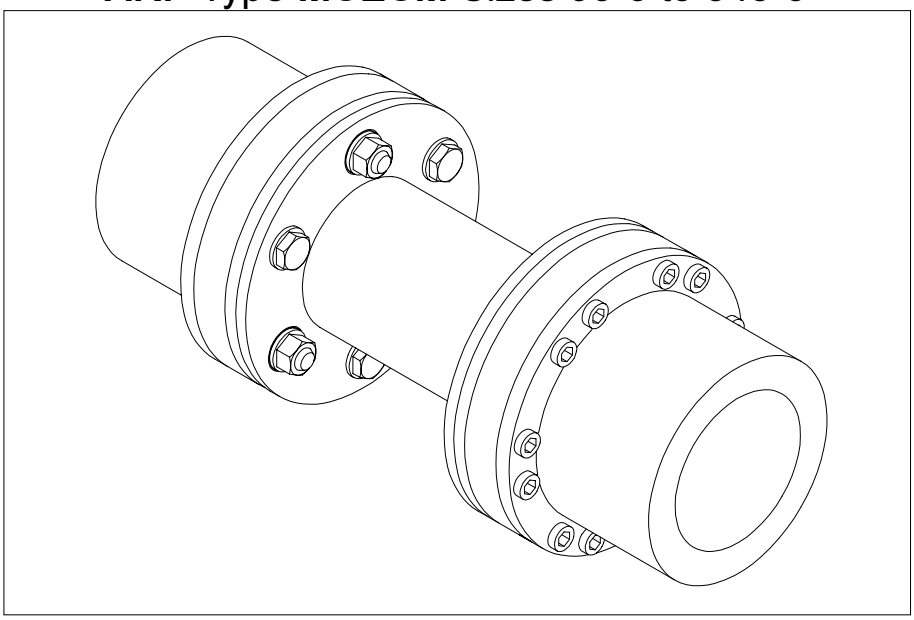
BA 8703 EN 08.03

for **ARPEX**® All Steel Couplings
of Series

ARP Type **NAN** Sizes 88-6 to 325-6



ARP Type **MCECM** Sizes 96-6 to 345-6



FLENDER

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Manufacturer´s Declaration

according to the meaning of the EU directive 98/37/EG appendix II B

Herewith we declare, that the

ARPEX® - All Steel Couplings of Series

ARP Type **NAN** Sizes **88-6** to **325-6**
ARP Type **MCECM** Sizes **96-6** to **345-6**

described in these operating instructions, are intended for incorporation into a machine and that their use is prohibited until it has been established that the machine, into which these components have been incorporated, corresponds with the EU directive (original version 98/37/EG incl. further amendments).

With this manufacturer‘s declaration, all coordinated standards are taken into account, in as far as they apply to our products, which are published by the EU commission in the gazette of the European Union.

Bocholt, 01.08.2003

Signature (Engineering)

Contents

1.	**Technical data**	
1.1	Dimensions of ARPEX components of type NAN	6
1.2	Dimensions of ARPEX components of type MCECM	7
1.3	Weights of ARPEX components types NAN and MCECM	8
2.	**General information**	
2.1	General	9
3.	**Safety information**	
3.1	Safety notes for the user	10
3.1.1	Marking of safety notes in the operating instructions	10
4.	**Transport and storage**	
4.1	Extent of supply	11
4.2	Transport	11
4.3	Storage	11
4.3.1	Storage of coupling parts	11
4.3.2	Storage of plate packs	11
4.3.2.1	General information	11
4.3.2.2	Store	11
5.	**Technical specification**	
5.1	General description	12
6.	**Assembly**	
6.1	Information on machining finish bores, axial safeguarding, setscrews, balancing	13
6.1.1	Finish bores	13
6.1.1.1	Keyways	14
6.1.2	Axial safeguarding	14
6.1.3	Setscrews	14
6.1.4	Balancing	15
6.2	General information on assembly	16
6.3	Mounting of coupling parts (shaft-hub connection with key)	16
6.4	Disassembly of shaft-hub connection with key	17
6.5	Shrink connections	17
6.5.1	Assembly	17
6.5.1.1	Mounting aids	17
6.5.1.2	Preparation for shrinking	18
6.5.1.3	Shrinking process	18
6.5.2	Disassembly of shrink connections	18
6.5.2.1	Ungraded shaft end	18
6.5.2.2	Graded shaft end	18
6.5.2.3	Viscosity of pressure oil	18
6.6	V-supports	19
6.6.1	Assembly	19
6.6.2	Disassembly	19

6.7	C-flange fastening	20
6.7.1	Condition on delivery	20
6.7.2	Assembly	20
6.8	Assembly of summation balanced couplings	21
6.9	Assembly of the drive train	21
6.10	Fitting the plate packs	22
6.10.1	Type NAN Sizes 88-6 to 256-6 and type MCECM Sizes 96-6 to 230-6 Tightening torque method	22
6.10.2	Type NAN Sizes 272-6 to 325-6 and type MCECM Sizes 245-6 to 345-6 Rotation angle method	22
6.10.2.1	Preparatory measures	22
6.10.2.2	Pretensioning of fitting bolt	22
6.10.3	Plate pack with integral axial end float limitation of type NAN	23
6.11	Technical data for plate pack assembly	25
6.12	Alignment	26
6.13	Possible misalignments	27
6.13.1	Permissible total misalignment, subject to axial and angular misalignment	28
6.13.2	Axial/angular misalignment	28
7.	**Putting into operation**	
7.1	Before operating	29
8.	**Operation**	
8.1	General operating data	29
9.	**Failures, causes and remedies**	
9.1	General	29
9.2	Possible failures	30
10.	**Maintenance**	
10.1	General	30
10.2	Replacing plate packs	30
11.	**Stocking of spare parts, addresses of service centres**	
11.1	Addresses of service centres	31

1. Technical data

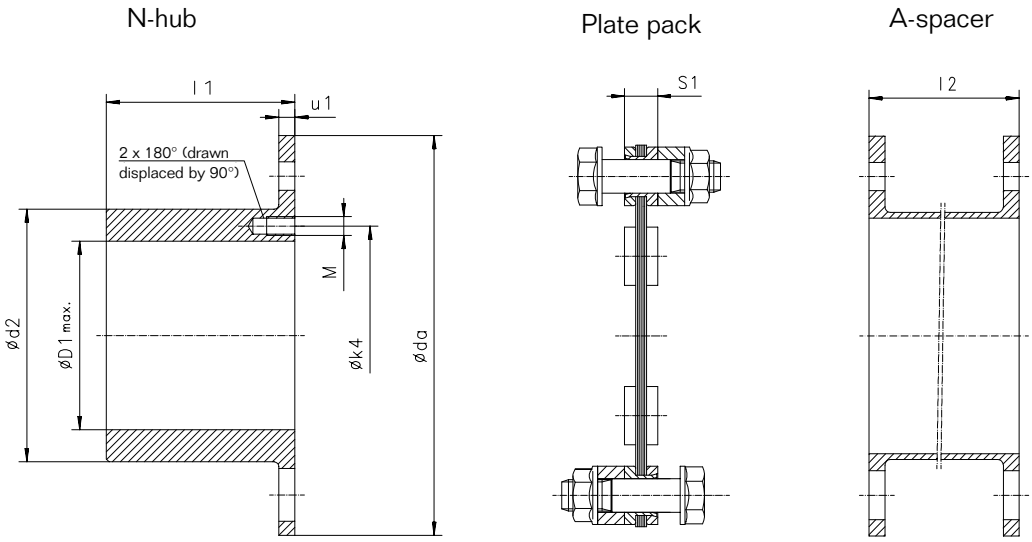
The following lists of technical data contain the most important details of the coupling. These data and the contractual agreement for the coupling determine the limits of its use according to the terms of the contract.

The nominal torques T_{KN} shown in the following lists are valid for:

- Continuous operation up to 24 h
- Operation within the stipulated alignment
- Operation within a temperature range from -20 °C up to +280 °C (ambient temperature resp. shaft end temperatures)

ATTENTION! **In order to ensure continuous, trouble-free operation, the coupling has to be selected with a service factor, adequate to the application. In case of changes in operating conditions (power rating, speed, changes on driver or driven machine) re-examination of the design is urgently necessary.**

1.1 Dimensions of ARPEX components of type NAN

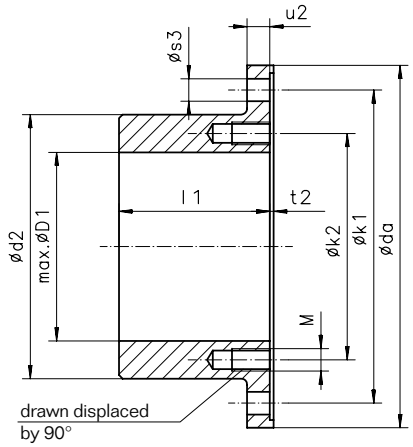


ARPEX-Coupling da Size	Nominal Torque T_{KN} Nm	Speed $n_{max.}$ 1/min	D1 max. mm	d2 mm	l1 mm	d mm	M mm	u1 mm	S1 mm	l2 mm
88-6	190	21700	35	48	40	58	6	4,5	6	88/128
115-6	270	16600	55	75	55	85	6	4,5	6	88/128/168
135-6	580	12700	65	86	65	102	8	6,5	7	86/126/166
150-6	660	11400	75	101	75	89	8	6,5	7	86/126/166 186/236
176-6	1220	9750	85	117	85	104	10	7	9	82/122/162 182/232
185-6	1875	9300	90	122	90	109	10	8	11	78/118/158 178/228
212-6	2850	8100	100	134	100	118	10	8,5	10	80/120/160 180/230
225-6	4200	7650	105	141	105	124	10	9	10	120/160 180/230
256-6	5750	6700	120	163	120	144	12	10,5	12	116/156 176/226
272-6	8050	6300	125	171	130	152	16	12	16	108/148 168/218
298-6	10000	5150	140	189	140	166	16	12	20	100/140 160/210
325-6	12000	4700	150	203	150	180	16	12,5	22	136/176/206

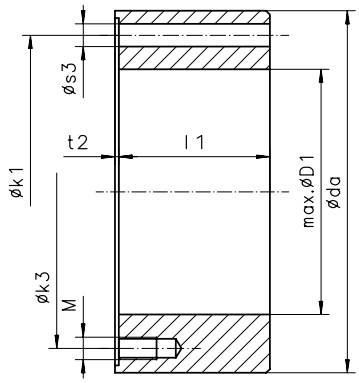
Table 1.1: Torques T_{KN}, speed $n_{max.}$, dimensions of ARPEX components type NAN

1.2 Dimensions of ARPEX components of type MCECM

M-hub



J-hub



C-flange

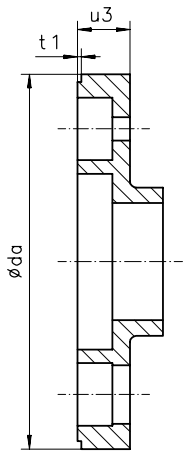
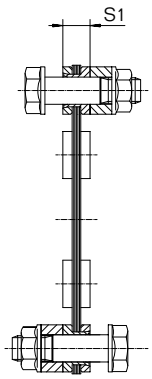
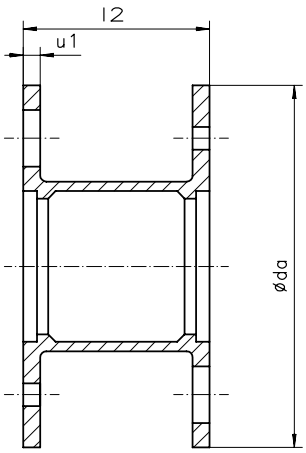


Plate pack



E-spacer



ARPEX-Coupling da Size	Nominal Torque T_{KN} Nm	Speed $n_{max.}$ 1/min	M-hub D1 max. mm	M-hub k2 mm	J-hub D1 max. mm	J-hub k3 mm	d2 mm	l1 mm	k1 mm	s3 mm	M mm	u1 mm	u2 mm	u3 mm	t1 mm	t2 mm	S1 mm	l2 mm
96-6	210	19900	50	60	65	83	70	50	83	6,8	6	4,5	6,0	14,5	1,3	1,0	6	58/98
120-6	490	15900	65	80	80	107	94	65	107	6,8	6	6,5	7,0	18,5	1,3	1,0	7	46/86 126
142-6	925	13400	75	92	95	127	109	75	127	8,5	8	7,0	8,0	21,5	1,3	1,0	9	76/116
162-6	1600	11800	85	104	108	143	122	85	143	11,0	8	8,0	9,5	25,0	1,8	1,5	11	64/104 124/174
190-6	2500	10000	105	125	125	168	145	105	168	14,0	10	8,5	10,5	24,5	1,8	1,5	10	66/106 126/176
214-6	3900	8900	115	140	140	190	164	115	190	14,0	10	9,0	10,0	31,0	2,3	2,0	10	54/94 114/164
230-6	5200	8300	125	150	155	204	174	125	204	15,5	10	10,5	13,0	31,5	2,3	2,0	12	90/110 160
245-6	7000	7800	130	158	165	217	185	130	217	17,5	12	12,0	16,0	40,0	2,3	2,0	16	66/86 136
275-6	9800	6250	150	182	185	245	213	150	245	17,5	16	12,0	16,5	37,0	2,8	2,5	20	80/130
310-6	12900	5550	170	205	205	280	240	170	280	17,5	16	12,5	17,5	44,5	2,8	2,5	22	112
345-6	17000	5000	190	228	230	309	267	190	309	22,0	16	14,0	19,0	47,0	3,3	3,0	24	108

Table 1.2: Torques T_{KN}, speed $n_{max.}$, dimensions of ARPEX components type MCECM

1.3 Weights of ARPEX components types NAN and MCECM

Size da mm	Weight Hub max. D1 kg	Plate pack kg	A-spacer l2 mm	A-spacer kg
88-6	0,4	0,11	88	0,5
			128	0,6
115-6	1,1	0,12	88	0,7
			128	0,8
			168	1,0
135-6	1,7	0,37	86	1,2
			126	1,4
			166	1,6
150-6	2,6	0,39	86	1,4
			126	1,6
			166	1,8
			186	2,0
			236	2,3
176-6	4,1	0,90	82	1,9
			122	2,1
			162	2,4
			182	2,6
			232	2,9
185-6	4,6	1,14	78	2,3
			118	2,6
			158	3,0
			178	3,1
			228	3,6
212-6	6,2	1,87	80	3,2
			120	3,6
			160	3,9
			180	4,1
			230	4,6
225-6	7,2	2,59	120	4,4
			160	4,9
			180	5,2
			230	5,9
256-6	11,2	3,88	116	6,3
			156	7,1
			176	7,4
			226	8,4
272-6	13,8	4,25	108	7,5
			148	8,3
			168	8,7
			218	9,7
298-6	17,3	8,67	100	9,0
			140	10,0
			160	10,5
			210	11,9
325-6	21,6	10,95	136	12,2
			176	13,4
			206	14,4

Table 1.3: Weights type NAN

Size da mm	Weight M-hub max. D1 kg	J-hub max. D1 kg	C-flange kg	Plate pack kg	E-spacer l2 mm	E-spacer kg
96-6	1,0	1,7	0,6	0,1	58	0,5
					98	0,6
120-6	2,2	3,4	1,1	0,3	46	1,0
					86	1,2
					126	1,4
142-6	3,5	5,6	1,7	0,6	76	1,7
					116	2,0
162-6	5,1	8,5	2,6	0,9	64	2,3
					104	2,8
					124	3,0
					174	3,5
190-6	8,0	14,6	3,4	1,2	66	3,5
					106	4,1
					126	4,4
					176	5,2
214-6	11,5	20,1	5,6	1,8	54	4,5
					94	5,4
					114	5,9
					164	7,0
230-6	14,1	24,5	6,3	2,5	90	6,5
					110	7,0
					160	8,2
245-6	17,9	29,5	8,7	3,6	66	7,9
					86	8,6
					136	10,3
275-6	25,6	41,8	10,8	4,6	80	10,2
					130	12,3
310-6	35,8	60,6	16,7	6,6	112	15,0
345-6	49,7	84,4	20,4	8,7	108	21,0

Table 1.4: Weights type MCECM

2. General information

2.1 General

These operating instructions should always be kept accessible near the coupling.

Only exact knowledge of the operating instructions ensures trouble-free coupling operation. Therefore, it is in the interest of our customers that these instructions are read, understood and in all aspects observed by personnel responsible for transport, assembly and operation.

Note: We cannot be held responsible for damages and operating hold-ups, resulting from failure to comply with the operating instructions.

The "couplings" dealt with in these instructions, have been designed for stationary applications in general mechanical and plant engineering.

Possible applications for couplings of these series are e.g. oil industry, conveyors, pumps, ventilators, (turbo) compressors, (turbo) blowers, ventilators, fans etc.

The couplings are designed only for the application range stated in section 1 "Technical data". Deviating operating conditions necessitate a new contractual agreement.

The couplings described herein, correspond to the state of technology at the time of going to press.

In the interest of further development, whilst maintaining the essential characteristics, we reserve the right to make changes, which are deemed to increase its capacity and safety.

The copyright on these operating instructions remains with FLENDER.

Reproductions whole or in part, without our permission, are not permitted: it must not be used for the purpose of unauthorised competition or made available to third parties.

Please refer all technical queries to the factory

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or to one of our service centers. A list of centers can be found in section 11 "Stocking of spare parts, addresses of service centres"

3. Safety information

3.1 Safety notes for the user

- The coupling has been designed according to the state of technology and is supplied in a safe to operate condition. Unauthorized modification, which interfere with the operational safety are not permitted. This applies also to guarding devices, which have been put up against unintentional contact.

- The coupling is to be installed and operated only within the scope of conditions laid down in the supply contract.

- The customer has to ensure that all personnel engaged in assembly, operation, care and maintenance, have read and understood these operating instructions and that they strictly observe all points to:

  - avert danger to life and limb of users and third parties,

  - safeguard the operational safety of the coupling

    and

  - exclude downtime and environmental damage through wrong handling.

- The relevant regulations and instructions concerning health and safety at work, and environment protection have to be observed for transport, assembly and disassembly, operation and maintenance.

- The coupling is to be operated and maintained only by authorised and trained personnel.

- All work has to be carried out carefully and from the point of view of "safety".

- Any work on the coupling has to be carried out whilst it is at rest. The driver is to be safeguarded against unintentional starting (e.g. by locking the key switch or removing fuses in the mains supply). A notice should be placed at the start-up location which says that work is being carried out on the coupling.

- The driver is to be switched off at once, if, during operation, any changes such as changed running noise, can be noticed on the coupling.

- The coupling is to be protected by appropriate protecting guards against accidental touching.

- When the coupling is incorporated in machines or equipment, the manufacturer of the machine or equipment is obliged to include all instructions, notes and descriptions of these operating instructions in his operating instructions.

3.1.1 Marking of safety notes in the operating instructions

Any important instructions which refer to safety and operational protection have been marked by:

This symbol points to safety measures, which must be followed to avoid **personal injuries**.

ATTENTION! This symbol refers to safety measures which must be observed to avoid **damage to the coupling**.

Note! This note refers to **general operating instructions**, which should be specially noted.

4. Transport and storage

4.1 Extent of supply

The extent of supply is listed on the transport documents. Its completeness should be checked on delivery. Possible transport damage and/or missing parts should be reported immediately in writing. After consultation with Messrs. Flender an expert should be called in.

4.2 Transport

Subject to transport route and size, the coupling is packed differently. If not specially agreed in the contract, the packing corresponds to guide lines HPE. Symbols on the packaging should be noted. They have the following meaning:

Top | Fragile | Keep dry | Sensitive to heat | Centre of gravity | Do not use hook | Secure here

ATTENTION! **Make sure to use suitable lifting gear.**

4.3 Storage

4.3.1 Storage of coupling parts

The coupling is supplied with a protective coating and can be stored for up to 6 months, indoors at a dry location. In case longer storage is intended, a corresponding long-term conservation is necessary (refer to FLENDER).

4.3.2 Storage of plate packs

4.3.2.1 General information

Properly stored plate packs remain unchanged in their characteristics. Storage under unfavourable conditions and improper handling will have a negative influence and a change of physical properties will result. These changes can come about through reaction to oxygen, ozone, extreme temperatures or damp.

4.3.2.2 Store

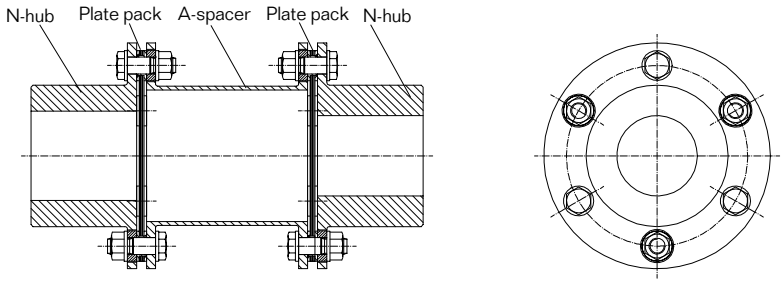
The storage place should be dry and dust-free. The plate packs are not to be stored together with corrosive chemicals, acids, alcaline solutions etc.

ATTENTION! **Damp storage places (relative humidity above 65%) are unsuitable. Care should be taken that no condensation develops.**

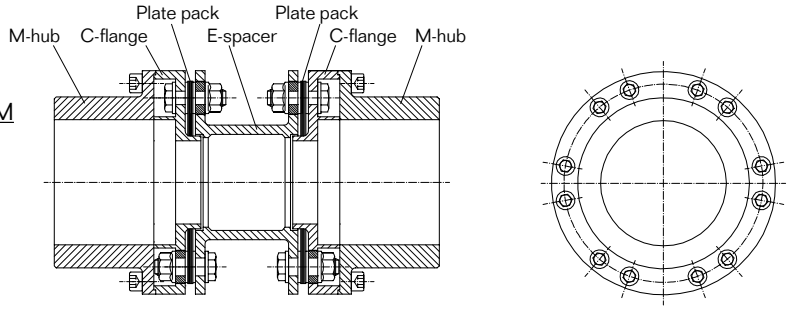
5. Technical specification

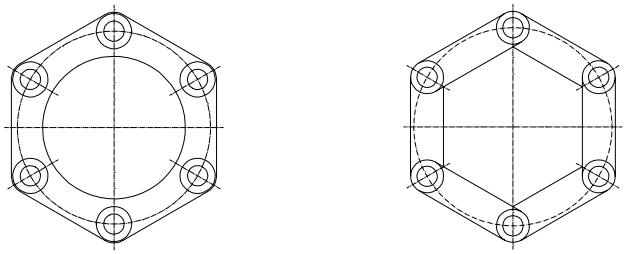
5.1 General description

Type NAN



Type MCECM





Ring plate pack **Side bar plate pack**

ARPEX couplings are all steel couplings. The plate packs are placed between flanges of coupling parts and spacer and alternately bolted with them.

Individual thin steel plates are assembled on bushings and are pressed tightly together by an inserted, internally bevelled, retaining ring. The retaining ring is fastened by the expanded end of the bushing, which fits snugly against it. As all joints are built-up like this, the plate pack forms a compact unit.

By this arrangement of plate packs, the ARPEX coupling is torsionally stiff and torque is transmitted without backlash.

ARPEX couplings of series ARP type NAN sizes 88-6 to 272-6 have ring plate packs, sizes 298-6 and 325-6 are supplied with side bar plate packs (see illustration). All sizes of type MCECM are supplied with ring plate packs. Collar bolts with collar nuts connect plate packs with spacer- and coupling part flanges. Additionally a catching ring is integrated between bush and collar nut of each bolting unit, which locks the spacer in case of plate pack fracture.

ARPEX couplings of series ARP meet the requirements of API 610.

The size identification of the coupling is on the outside diameter (øda) of coupling flange in mm. This identification is complemented by a preceding combination of letters, which specify the coupling components.

Example: ARP MCECM 275-6
Coupling with two M-hubs (M), two C-flanges (C) and one E-spacer (E) size 275-6 of series ARP

6. Assembly

6.1 Information on machining finish bores, axial safeguarding, setscrews, balancing

6.1.1 Finish bores

- Remove rust preventive coating from coupling parts.

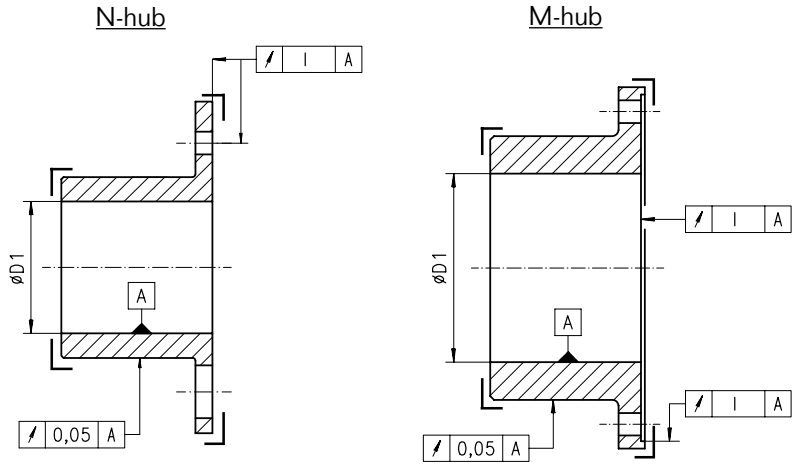
Observe manufacturer's instructions regarding handling of solvents.

In order to machine finish bores components have to be carefully aligned. Limits for concentric and offset mislignment are listed in table 6.1. Parts have to be held at the planes marked thus (⌈).

ATTENTION! **The max. permissible bore diameters apply to drive type fastenings without taper action according to DIN 6885/1 and must not be exceeded under any circumstances.**

If instead of the planned drive type fastening other shaft- hub connections (e.g. splined hub profiles, tapered or stepped bores, stressed type fastenings with taper action) are to be used, consult FLENDER.

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!



Bore diameter $D1_{max.}$ mm	Concentr. I mm
< 76,2	0,025
≥ 76,2 < 101,6	0,038
≥ 101,6 < 127,0	0,051
≥ 127,0 < 152,4	0,064
> 152,4	0,076

Table 6.1: Permissible radial and offset misalignment acc. to API 610

For drive connections by keys, the following combination of fits are specified:

Type of fit	Shaft limits	Bore limits	
		Reversing operation	One-direction operation
Interference fit with keyway	h6	P7	N7
	k6	M7	H7
	m6	K7	H7
	n6	J7	H7
	p6	H7	F7
Shrink fit	Customer's specification	on request	on request

Table 6.2: Combinations of fits

ATTENTION! **Observation of fit combinations is necessary, on the one hand, in order to keep the clearance in the shaft hub connection as low as possible, depending on utilization of the tolerance bands and, on the other hand, to limit hub stressing arising due to the interference within the permissible levels. Non-compliance may endanger the shaft-hub connection.**

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

6.1.1.1 Keyways

Keyways have to be machined to suit the existing keys. For keyways, the tolerance band of hub keyway width ISO P9 has to be kept to.

6.1.2 Axial safeguarding

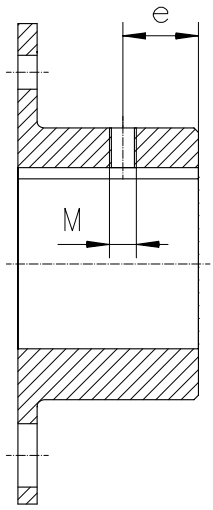
A setscrew or endplate can be used for axial safeguarding of coupling parts. If end plates are to be used, contact FLENDER with regard to the recessing of coupling parts.

6.1.3 Setscrews

To avoid damaging the shaft, the setscrew bore should be machined over the keyway.

Size		max. Thread	Size		max. Thread
NAN	MCECM	mm	NAN	MCECM	mm
88-6		M5	256-6	214-6	M12
115-6	96-6	M6	272-6	230-6	M12
135-6		M6		245-6	M12
150-6	120-6	M8	298-6		M16
176-6	142-6	M10	325-6	275-6	M20
185-6		M10		310-6	M24
212-6	162-6	M12		345-6	M24
225-6	190-6	M12			

Table 6.3: Setscrew allocation



The following guide lines should be observed!

The setscrews are to be located at the centre of the hub core, as shown in above illustration. If this is not practical, please note that the clearance distance **(e)** to the setscrew is to be at least M x 1,5.

Hexagon socket setscrews with cup point according to DIN 916 should be used.

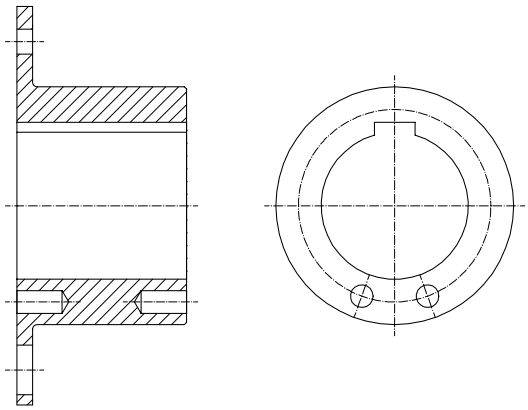
The setscrew length should fill the threaded hole but not project above the hub (L min = M x 1,2)

6.1.4 Balancing

Rough drilled couplings resp. rough-drilled coupling parts are supplied in an unbalanced condition. For these components it is recommended that they are balanced, subject to their intended use, after finish boring (for this purpose, we refer to DIN 740, DIN ISO 1940 part 1).

Balancing is usually achieved by removing metal through drilling. In order to limit the material to be removed to a minimum, a rather large equalizing radius should be chosen.

Finish bored couplings or coupling parts are supplied in a balanced state according to customer's specification.



Arrangement of balancing holes in case of hubs with keyway when balancing in one plane (balanced after keywaying).

6.2 General information on assembly

When assembling , the **safety instructions** of section 3 should be observed.

Assembly is to be carried out with great care by skilled fitters.

Care should be taken, already at the planning stage, that adequate space is available for assembly and subsequent maintenance work.

Adequate lifting gear should be on hand at the start of assembly.

Under no circumstances can any sort of welding work be allowed on the coupling or coupling parts, as this will have a negative influence on the mechanical properties of the coupling.

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

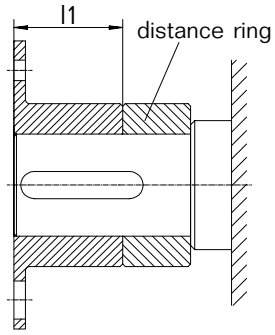
6.3 Mounting of coupling parts (shaft-hub connection with key)

Prior to starting, finish bores and surfaces for spacer rings and nuts resp. close fitting bolts (subject to assembly procedure, see sect. 6.10) have to be thoroughly cleaned and rust protection removed. The same applies to shaftends.

Observe manufacturer's instructions regarding handling of solvents.

ATTENTION! **The coupling parts have to be mounted using suitable equipment, so as to avoid damaging any shaft bearings through axial mounting force. Use suitable lifting gear.**

Shaft ends should not protrude over hub inside faces. If necessary, place spacers or distance rings to bridge the gap between coupling and shaft shoulder. Axial safeguarding by setscrew or endplate.



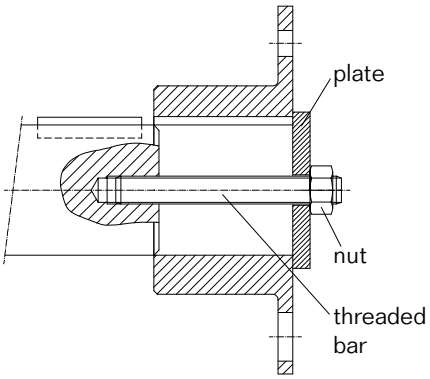
ATTENTION! **Tighten setscrews only with hex. key according to DIN 911, without extention pipe.**

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

For hubs with key connection it is recommended to warm the coupling hubs to max. 150 °C, this will facilitate mounting.

Take care not to get burned by hot components.

A mounting device will ease fitting hubs with transition fits and heated hubs on the lightly oiled shaft end.



Bar is threaded into shaft end; size of thread depends on available shaftdiameter. Put a plate of appropriate size over the threaded bar. By tightening the nut the hub moves onto the shaft.

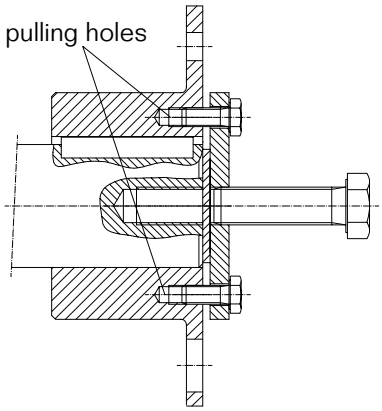
6.4 Disassembly of shaft-hub connection with key

To pull a coupling hub from the shaft, the plate packs have to be disassembled first. Then remove the endplate if applicable resp. loosen setscrew. With the aid of a three-armed puller resp. by placing a pulling device in the threaded holes, remove the hub from the shaft.

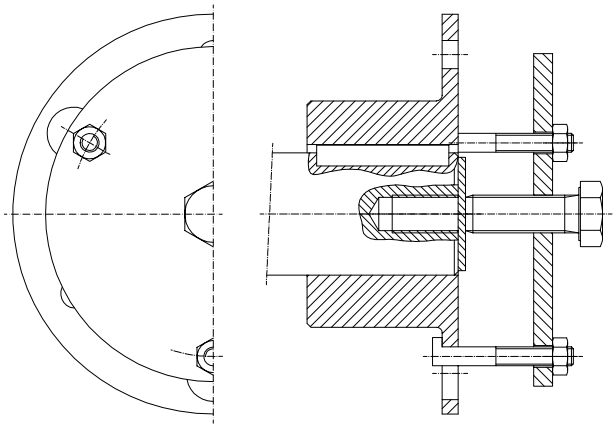
In case of a tight fit, warm the hub uniformly with a burner and carefully pull the hub with a pulling device from the shaft.

Take care not to get burned by hot components!

Check disassembled components carefully before reuse or return them, if necessary, to FLENDER for repairs.



Hub with pulling holes



Three-arm puller
(can not be used on J-hubs)

6.5 Shrink connections

6.5.1 Assembly

Cylindrical shrink connections are joined by heating the outer part. To avoid premature binding, joining should be carried out speedily in a draught-free space.

Attention should be paid to a short transport distance!

6.5.1.1 Mounting aids

- Hot air oven or ring burner
- Crane with rapid lowering facility (for vertical shaft)
- Cleaning agents, solvents, brushes, rags

6.5.1.2 Preparation for shrinking

- Parts should be visually checked
  Particularly noting the following points:
  - chamfer on shaft and hub bore
  - shrink fit surfaces without any damage
  - undamaged threaded connections for hydraulic implements.

- Remove preserving coat from parts to be joined with solvent

Observe manufacturer's instructions regarding handling of solvents.

- Check penetrability of oil channels and lengths of threads of thread connections.

- Heat hub uniformly to the specified temperature.

Take care not to get burned by hot components!

6.5.1.3 Shrinking process

- Preferred shaft position, if possible, is vertical.
- Locate heated hub without tilt, taking note of the leading-in chamfer.
- Lower hub without interruption down to the shoulder, taking care that no tilting occurs.
- Leave parts to cool slowly to room temperature
- parts can stressed after approx. 24 hours.

Take care not to get burned by hot components!

6.5.2 Disassembly of shrink connections

To disassemble a coupling hub with a cylindrical shrink fit, the plate packs and the spacer have to be disassembled first.

When disassembling in cold surroundings, the shrink connection should be slightly warmed up.

6.5.2.1 Ungraded shaft end

Depending on the length of the coupling hubs, there are one or more oil grooves. The oil must be pressed into the shrink fit with the aid of one or more pumps, subject to the number of oil grooves. The axial movement is realized with the help of a separate hydraulic press or mechanical puller.

6.5.2.2 Graded shaft end

The coupling hubs are furnished with at least one oil groove. A motor driven pump must be installed at the transition from the smaller to the bigger diameter of the shaft, due to the large amount of oil which is needed in a short time. A hand-operated pump is sufficient for all other oil connections. The axial movement is caused by the pressure effect at the grade.

6.5.2.3 Viscosity of pressure oil

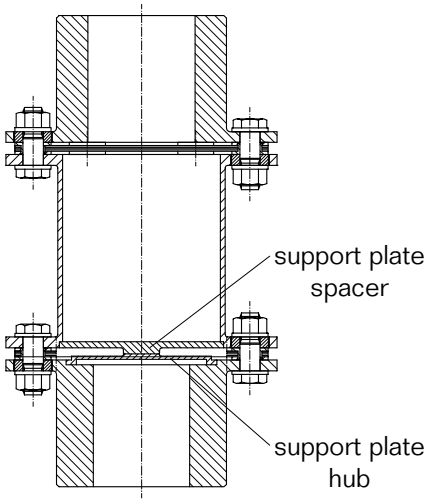
Under normal temperature conditions thin-bodied, pure mineral oil with a viscosity of 6 to 10°E at 50°C serves best as pressure oil.

However, should oil escape in masses, so that the pressure cannot be held on disassembly, the use of more heavy-bodied oil is possible.

6.6 V-supports

Plate packs of ARPEX couplings are axially flexible and thus **cannot** support the weight of a spacer in a vertical application. Support plates are optionally available, which direct the spacer weight as an axial thrust force to the machine bearing, without straining the plate pack.
For applications of this type, spacers and connecting pieces are fitted, fully functional, at the factory. The support plates are adapted and fitted to suit the coupling types.

Example:
NAN with V-support



6.6.1 Assembly

When assembling a N-hub, the factory fitted support plate has to be removed by unscrewing the three studscrews with an Allan key. The hub is then mounted on the shaft end as described in section 6.3.

After mounting, reassemble the support plate in the hub, locate it properly and screw in the three studscrews. Take care that the support plate seating is flat.

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

Now the plate pack is positioned on the hub face and the spacer with the factory fitted support plate is located on the lower support plate; after this, the second plate pack and close fitting bolts are inserted and assembled (see section 6.10 f).

6.6.2 Disassembly

Remove spacer and plate packs in reverse order. Unscrew the three studscrews and with two forcing screws in the support plate, lift it out of the recess. When replacing plate packs, check the V-support plates and renew them if necessary.

6.7 C-flange fastening

6.7.1 Condition on delivery

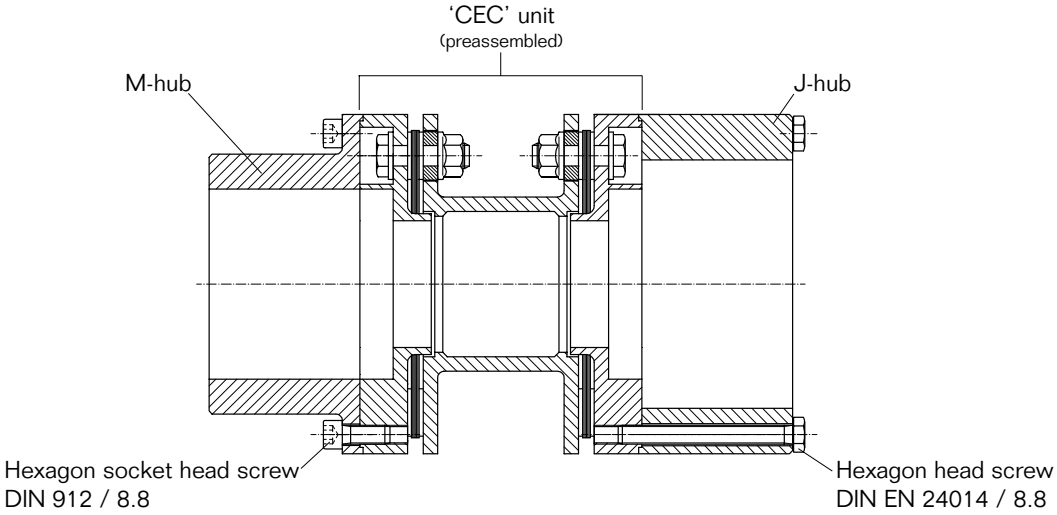
C-flanges of type MCECM are ready assembled with a spacer and supplied as 'CEC' unit.

6.7.2 Assembly

Before assembling, clean coupling parts carefully with the help of a suitable solvent.

Observe manufacturer's instructions regarding handling of solvents.

- Check recesses and contact faces of F-flanges for possible damage and rework them if necessary.
- Take great care in making recess connections.
- The connecting bolts have to be tightened evenly one after the other with the specified torque (see table 6.4), being careful that the recess connection is not tilted.



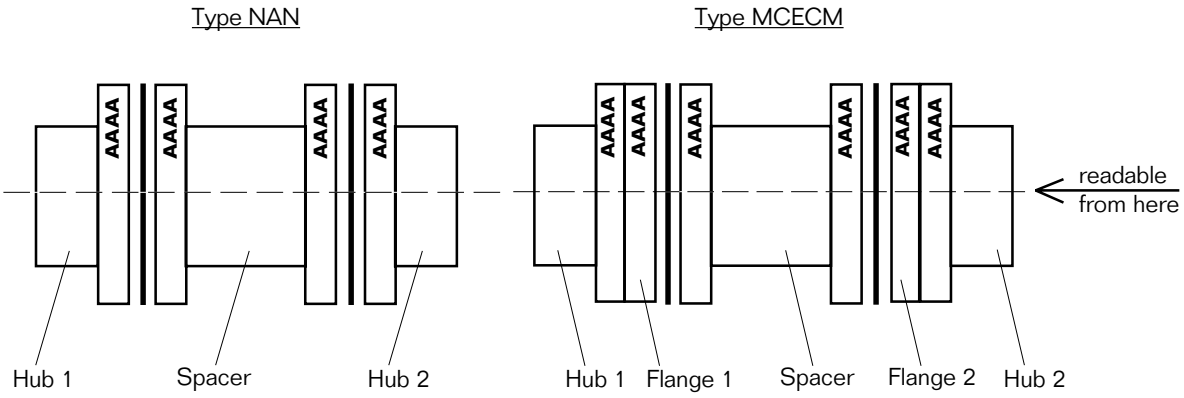
ATTENTION! **Non-observance of these instructions can impair the proper function of the coupling.**

M-hub hexagon socket head screw DIN 912 / 8.8	J-hub hexagon head screw DIN EN 24014 / 8.8 (former DIN 931)	Tightening torque T_A
M6		9 Nm
M8		20 Nm
M10		41 Nm
M12		70 Nm
M14		110 Nm
M16		170 Nm
M20		330 Nm

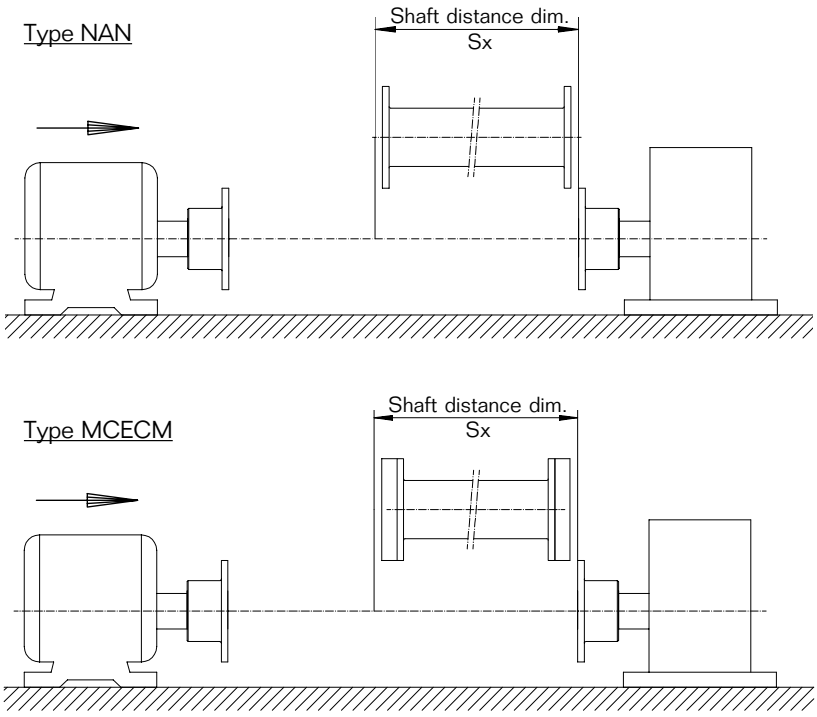
Table 6.4: Tightening torques of connecting bolts

6.8 Assembly of summation balanced couplings

Couplings which are summation balanced, have a multidigit number stamped on each component flange OD. Take care on assembly, that only coupling parts are bolted together which have the same numbers on their flange OD. The components have to be arranged so that numbers are in one line, to be readable from one direction (see illustration). Only this arrangement guarantees the requirements.



6.9 Assembly of the drive train



Move machines to be coupled to the specified shaft distance dimension.

Take care, danger of bruising!

6.10 Fiiting the plate packs

6.10.1 Type NAN sizes 88-6 to 256-6 and type MCECM sizes 96-6 to 230-6 Tightening torque method

Assembly of plate packs is carried out, depending on size, according to illustrations on page 24. Plate packs have to be bolted to the coupling part, so that rings (item 1 - figure 1, page 24) are adjacent to ARPEX flange (item 2) and nuts to the catching rings (item 3). The bolts must be used in the as-delivered condition, **additional lubrication or greasing of the bolts is not allowed!**

The tightening torque for the bolts must be applied to the nuts and the bolt head be secured against turning. This protection against turning must be supported on the flange to which the plate pack is fastened. Tighten nuts one after the other with torques T_A listed in table 6.5 on page 25.

Example: Type **MCECM**; Size **214-6**
Thread **M16** (thread in condition of delivery)
Tightening torque **T_A = 250 Nm**

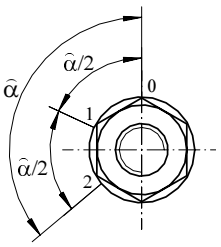
Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

6.10.2 Type NAN sizes 272-6 to 325-6 and type MCECM sizes 245-6 to 345-6 Rotation angle method

6.10.2.1 Preparatory measures

- Apply lubricant (ATEC special paste - Klüber Altemp Q NB 50) to the contact faces of the nut and the bolt head and the thread of the fitting bolt. This lubricant is included in the scope of a plate pack supply. Bolt the plate pack alternately together with the coupling components, so that the rings (item 1, Fig. 1 and 2, page 24) contact the ARPEX flange (item 2) and the nuts contact the catching rings (item 3).

- The tightening torque for the bolts must be applied to the nuts and the bolt head be secured against turning. This protection against turning must be supported on the flange to which the plate pack is fastened. Tighten the nuts as follows:



Arc angle on the collar of the nut

Fig. I

6.10.2.2 Pretensioning of fitting bolt

The following procedure is recommended:

- Tighten the nuts consecutively using torque T_0 (see table 6.5 on page 25).

- Mark a clearly visible zero position at any point on the collar of the nut as well as on the flange (see Fig. II). It is recommended to choose a corner of the hexagon as zero position.

- Starting from the zero position mark the turning angle $\alpha/2$ and α [deg] respectively $\hat{\alpha}/2$ and $\hat{\alpha}$ [arc angle] - see table 6.5 on page 25 - in a counter-clockwise direction on the collar of the nut (see Fig. I).

Alternatively, the turning angle [deg] can also be transferred to the wrench socket, to avoid marking every single nut as described above. **Do not in any case mark the turning angle as arc angle according to table 6.5 on page 25 - these values relate exclusively to the collar of the nut!**

- Turn the nuts consecutively, starting from the zero position (marked on the flange) to the first angle mark $\alpha/2$ (on the wrench socket or the collar of the nut) in the tightening direction.

- Then turn the nuts up to the second mark α in a second tightening operation.

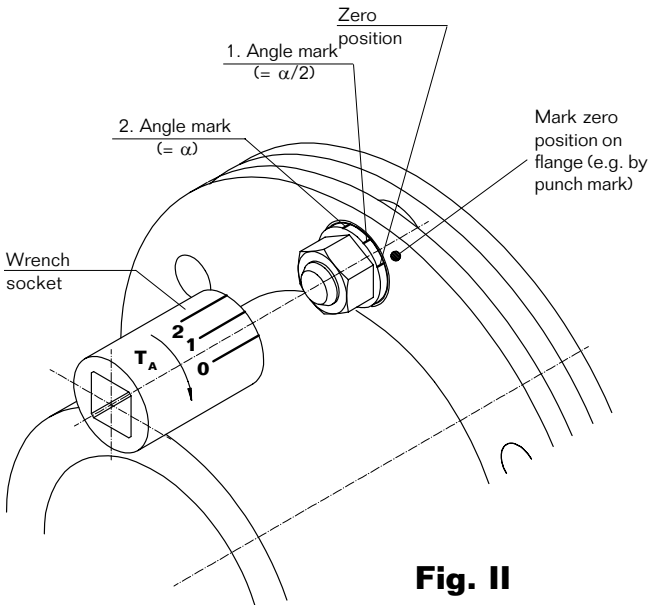


Fig. II

Example: Type **NAN**, size **298-6**, thread **M22**
Thread greased with special paste
Tightening torque T_0 = **70 Nm**
Rotation angle α = **55 degree**
Arc angle $\widehat{\alpha}$ = **19 mm**

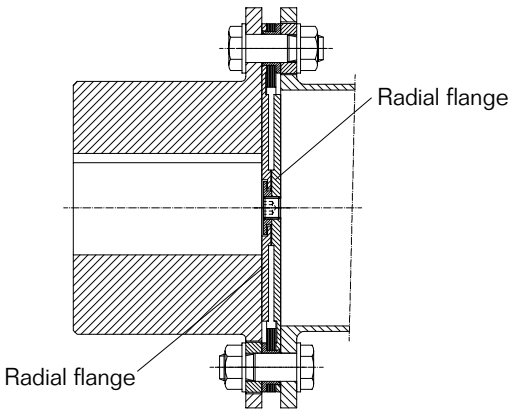
Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

6.10.3 Plate pack with integral axial float limitation for type NAN

For this subject the same procedures apply as described in sections 6.10.1 and 6.10.2.

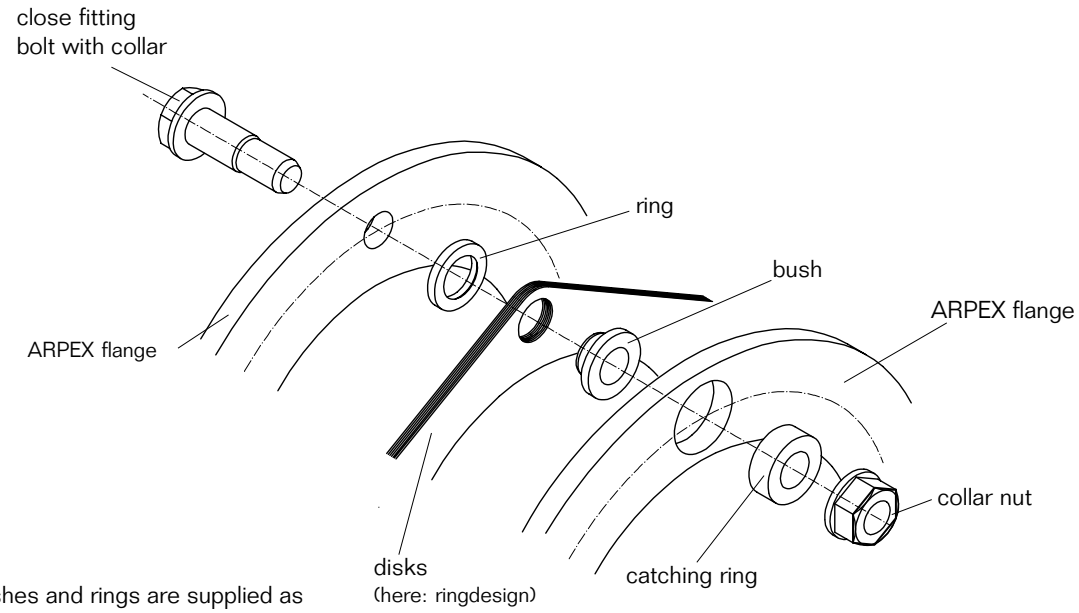
In addition, the following should be noted:

The plate pack has to be fastened to the coupling parts such that the radial flange of the plate pack sits close to the flange of the coupling part, as otherwise the proper function of the coupling cannot be guaranteed.



ATTENTION! **Non-observance of these instructions can impair the proper function of the coupling.**

Design of an ARPEX bolting point



Note:
Disks, bushes and rings are supplied as ready assembled, compact units!

Fig. 1

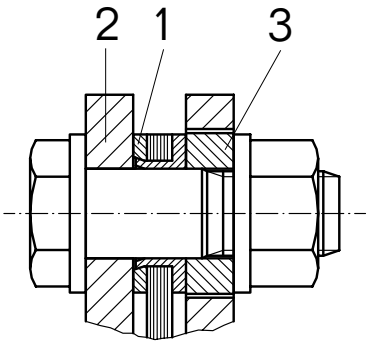


Plate pack
Type NAN, sizes 088-6 to 272-6
Type MCECM, all sizes
(Ring disks, collar nuts)

Fig. 2

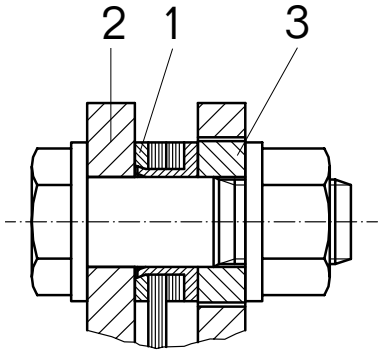


Plate pack
Type NAN sizes 298-6 to 325-6
(Side bar disks, collar nuts)

6.11 Technical Data for plate pack assembly

ARPEX Size Type NAN	ARPEX Size Type MCECM	Thread [mm]	A/F [mm]	Rotation angle method T_0 [Nm]	Rotation angle method Rotation angle α [deg]	Rotation angle method Rotation angle $\alpha/2$ [deg]	Rotation angle method Arc angle CollarØ [mm]	Rotation angle method Arc angle $\hat{\alpha}$ [mm]	Rotation angle method Arc angle $\hat{\alpha}/2$ [mm]	Tightening Torque T_A [Nm]	Remark
88-6	96-6	M6	10	--	--	--	--	--	--	12	Pretensioning by tightening torque T_A [Nm]. Additional lubrication or greasing of the bolts is **not** allowed!
115-6											
135-6	120-6	M8	13	--	--	--	--	--	--	30	
150-6											
176-6	142-6	M10	17	--	--	--	--	--	--	60	
185-6	162-6	M12	19	--	--	--	--	--	--	100	
212-6	190-6	M14	21	--	--	--	--	--	--	160	
225-6	214-6	M16	24	--	--	--	--	--	--	250	
256-6	230-6	M18	27	--	--	--	--	--	--	350	
272-6	245-6	M20	30	50	50°	25°	36	16	8	--	Pretensioning by angle of rotation. Threads and contact faces of nuts lubricated by special paste!
298-6	275-6	M22	32	70	55°	27,5°	40	19	10	--	
325-6	310-6	M24	36	90	50°	25°	45	20	10	--	
	345-6	M27	41	120	55°	27,5°	50	24	12	--	

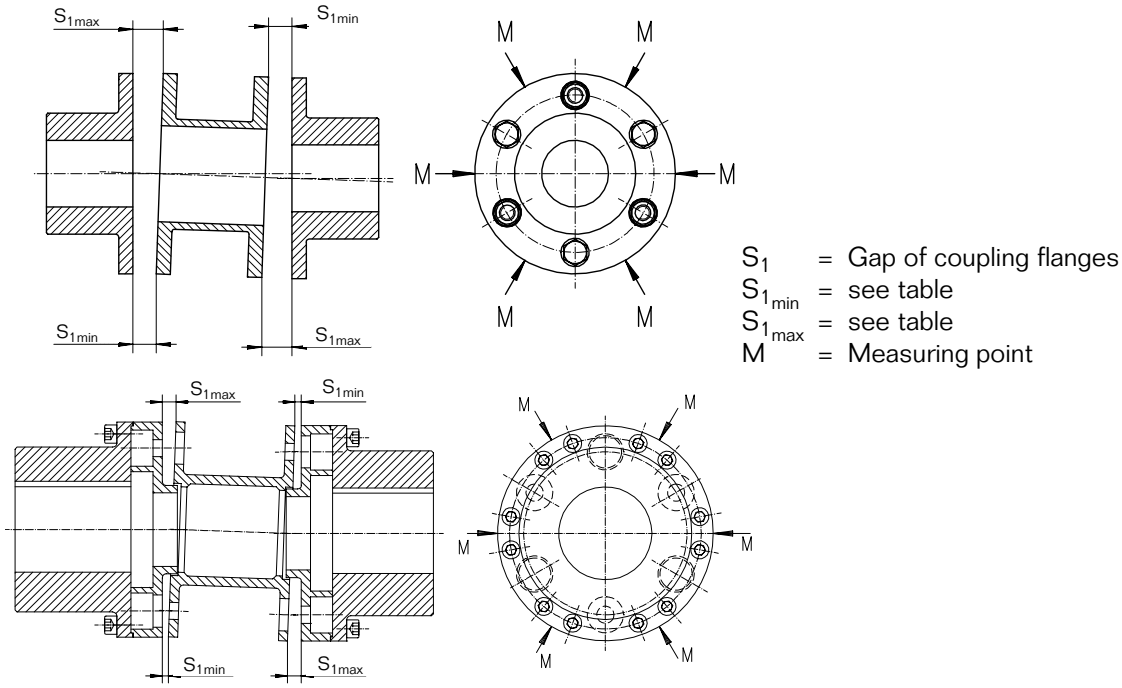
Table 6.5 Assembly values for plate pack fastening

6.12 Alignment

The couplings can compensate for misalignment of shafts to be connected up to the data listed in 6.13. The radial and angular misalignments of shaft ends is to be kept as small as possible.

Couplings featuring two plate packs can accomodate axial, radial and angular misalignments. Couplings with only one plate pack, accept just angular and axial misalignment.

On aligning machine parts, use a caliper gauge to measure gap S1 (see illustration) between coupling flanges at several measuring points. If the measured flange gaps are within the value range S_{1min} / S_{1max} (see table 6.6), then the alignment is sufficiently good.



S_1 = Gap of coupling flanges
S_{1min} = see table
S_{1max} = see table
M = Measuring point

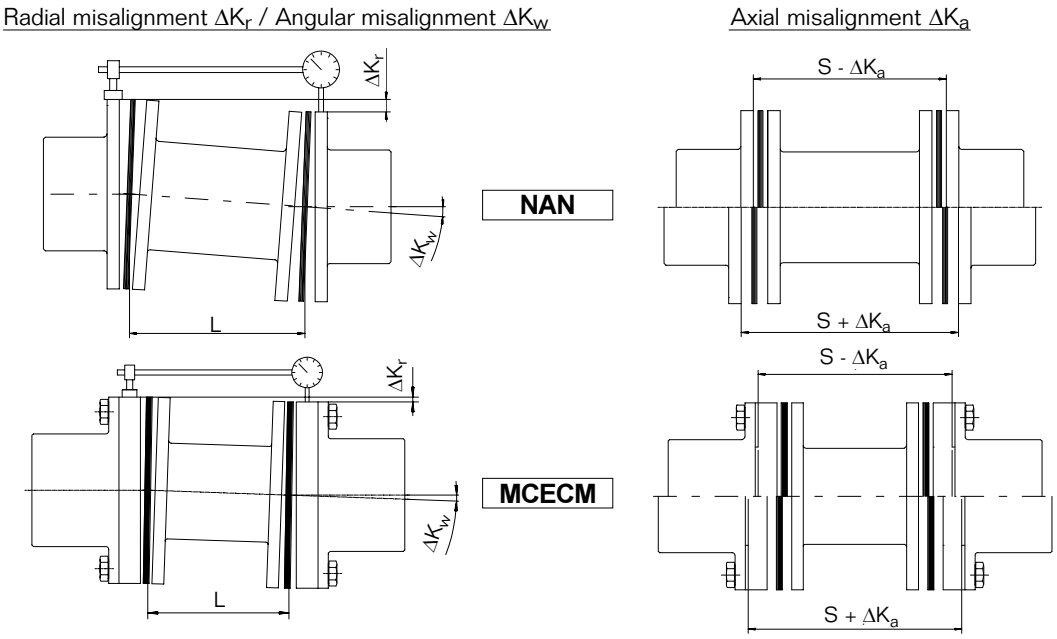
ATTENTION! **The assembly misalignment values must not exceed values for S_{1min} and S_{1max} (table 6.6). In order to have misalignment reserves for the operating process, it is advisable to align the couplings such that the assembly misalignment is smaller than stated below (see also sect. 6.13 f).**

Type NAN Size	S_1 min. mm	S_1 max. mm	Type MCECM Size	S_1 min. mm	S_1 max. mm
88-6	5,8	6,2	**96-6**	5,8	6,2
115-6	5,7	6,3	**120-6**	6,8	7,2
135-6	6,7	7,3	**142-6**	8,7	9,3
150-6	6,6	7,4	**162-6**	10,7	11,3
176-6	8,5	9,5	**190-6**	9,6	10,4
185-6	10,5	11,5	**214-6**	9,6	10,4
212-6	9,5	10,5	**230-6**	11,5	12,5
225-6	9,5	10,5	**245-6**	15,5	16,5
256-6	11,4	12,6	**275-6**	19,4	20,6
272-6	15,4	16,6	**310-6**	21,3	22,7
298-6	19,3	20,7	**345-6**	23,3	24,7
325-6	21,3	22,7			

Table 6.6: Permissible assembly misalignment

6.13 Possible misalignments

Misalignments of coupling parts relative to each other can occur from inaccurate alignment on installation or can be caused by operating factors (heat extension, shaft bending, machine frame too weak etc.).



Tables 6.7 and 6.8 list perm. misalignments in angular and at the same time, axial direction, whereby values for axial misalignment refer to 1 plate pack.

The listed values are the total allowable misalignments which are allowed to occur during operation; misalignments which occurs during the assembly process must be considered appropriately.

Permissable radial misalignment depends on the allowable angular misalignment and on center distance of plate packs.

$$\Delta K_r = \tan \Delta K_w \times L$$

L = center distance of plate packs
$L = S_2 - S_1$

Example for finding the permissible misalignment:

Required:
Perm. misalignment values for an ARPEX coupling type ARP NAN 212-6 with a shaft distance of S_2 = 250 mm.

a) Allow. angular misalignment = 0,7° at ΔK_a = 0 mm
Allow. axial misalignment = ± 3,06 mm (2 plate packs = 2 x 1,53 mm) at ΔK_w = 0°

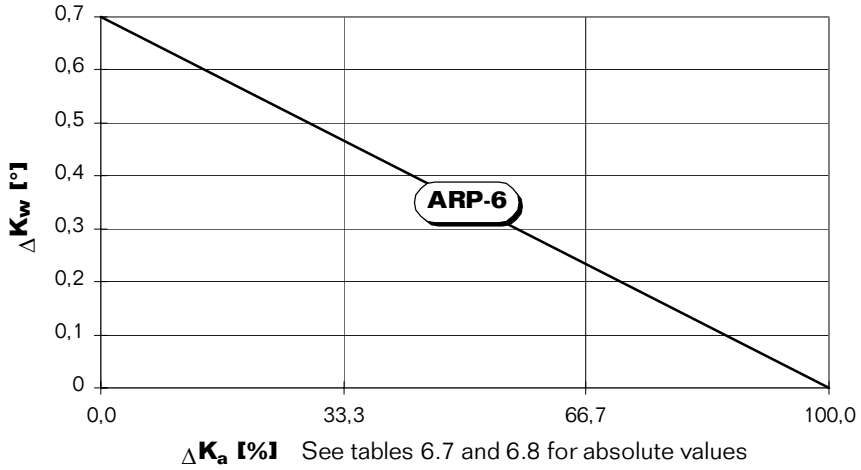
b) Allow. axial misalignment at ΔK_w = 0,3° = ± 1,76 mm (2 plate packs = 2 x 0,88 mm)

The corresponding allow. radial misalignment ΔK_r at an angular misalignment of 0,3° is calculated as follows:

Center distance of plate packs $L = S_2 - S_1$
= 250 mm - 10 mm = 240 mm

ΔK_r = tan (0,3°) x 240 mm = 1,26 mm

6.13.1 Perm. total misalignment, subject to axial and angular misalignment



See tables 6.7 and 6.8 for absolute values

ATTENTION! **The max. permissible misalignment values must not, under any circumstances, be exceeded during operation.**

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

6.13.2 Axial / angular misalignment

The listed axial misalignment ΔK_a must be understood as permissible tolerance values according to the S_1-value (see tables 1.1 and 1.2).

Size [mm]	Permissible axial misalignment ΔK_a [±mm]							
88-6	0,55	0,47	0,39	0,31	0,24	0,16	0,08	0,00
115-6	0,90	0,77	0,65	0,52	0,39	0,26	0,13	0,00
135-6	1,01	0,86	0,72	0,58	0,43	0,29	0,14	0,00
150-6	1,20	1,03	0,86	0,69	0,52	0,34	0,17	0,00
176-6	1,37	1,18	0,98	0,79	0,59	0,39	0,20	0,00
185-6	1,43	1,22	1,02	0,82	0,61	0,41	0,20	0,00
212-6	1,53	1,31	1,09	0,88	0,66	0,44	0,22	0,00
225-6	1,57	1,35	1,12	0,90	0,67	0,45	0,22	0,00
256-6	1,85	1,58	1,32	1,05	0,79	0,53	0,26	0,00
272-6	1,92	1,65	1,37	1,10	0,82	0,55	0,27	0,00
298-6	2,09	1,80	1,50	1,20	0,90	0,60	0,30	0,00
325-6	2,23	1,91	1,59	1,27	0,95	0,64	0,32	0,00
	0,0°	0,1°	0,2°	0,3°	0,4°	0,5°	0,6°	0,7°
	Permissible angular misalignment [°] ΔK_w							

Values are valid for 1 plate pack!

Table 6.7: Perm. axial and angular misalignment of type NAN

Size [mm]	Permissible axial misalignment ΔK_a [±mm]							
96-6	0,58	0,49	0,41	0,33	0,25	0,16	0,08	0,00
120-6	0,73	0,63	0,52	0,42	0,31	0,21	0,10	0,00
142-6	0,86	0,74	0,62	0,49	0,37	0,25	0,12	0,00
162-6	1,03	0,89	0,74	0,59	0,44	0,30	0,15	0,00
190-6	1,18	1,01	0,84	0,67	0,51	0,34	0,17	0,00
214-6	1,34	1,14	0,95	0,76	0,57	0,38	0,19	0,00
230-6	1,44	1,23	1,03	0,82	0,62	0,41	0,21	0,00
245-6	1,49	1,28	1,07	0,85	0,64	0,43	0,21	0,00
275-6	1,69	1,45	1,21	0,97	0,72	0,48	0,24	0,00
310-6	1,92	1,65	1,37	1,10	0,82	0,55	0,27	0,00
345-6	2,12	1,82	1,52	1,21	0,91	0,61	0,30	0,00
	0,0°	0,1°	0,2°	0,3°	0,4°	0,5°	0,6°	0,7°
	Permissible angular misalignment [°] ΔK_w							

Values are valid for 1 plate pack!

Table 6.8: Perm. axial and angular misalignment of type MCECM

7. Putting into operation

7.1 Before operating

Check all bolt connections and retighten them if necessary. Alignment and gap dimension S1 should also be checked and corrected if necessary (see table 6.6 resp. 6.7 and 6.8). **Then mount the coupling guard, protection against unintentional contact.**

Disregarding these notes can cause damage to the coupling. Flying metal fragments can cause serious personal injuries!

8. Operation

8.1 General operating data

During operation, pay attention to

- changing running noises
- suddenly occuring vibrations.

ATTENTION! **In case any irregularities are noticed during operation, the drive must be stopped at once. Determine the cause of trouble with the aid of the trouble-shooting check list (sect. 9) which features possible sources, their causes and proposals to eliminate them. In case, the cause cannot be found resp. if there is no possibility to remedy the trouble with own resources, we recommend calling for a service engineer from one of our service depots (sect. 11).**

9. Failures - causes and remedies

9.1 General

The following listed failures can only be clues in the search for any cause of faults.

In complex drive situations, all other components have to be included in the search.

During all operating phases, the coupling should run with low noise and without vibration. Different operating behaviour should be seen as a fault, which has to be remedied promptly.

Before beginning any maintenance activities, repairs or other work, the operator has to ensure that the complete drive has stopped. The driver has to be secured against unintentional starting; otherwise we refer to the particular health and safety requirements for the installation.

9.2 Possible failures

Failure	Possible cause	Remedy
Sudden change in noise level and/or suddenly occuring vibrations	Change in alignment	Stop drive Remedy reason for change in alignment (e.g. tighten loose foundation bolts) Check for wear; proceed as described in sect. 10
	Broken plate pack, transmission of torque by close fitting bolts	Stop drive Disassemble coupling and remove remainder of plate pack Check coupling components and replace damaged parts Check alignment and correct it, if necessary

Table 9.1 : Possible failures

10. Maintenance

10.1 General

ARPEX couplings should be visually checked corresponding to the maintenance schedules of the plant, but at least once a year. Special attention is to be paid to the condition of the plate packs. Should individual plates or whole strands be broken, then the particular plate pack has to be replaced; in these cases, check also the coupling flanges for damage.

Any further maintenance work is not necessary.

10.2 Replacing plate packs

Original ARPEX plate packs should only be used as replacement, to guarantee proper torque transmission and trouble-free function.

Note: As a rule, replacing plate packs is possible without the necessity to shift coupled drive members.

For reassembly, carefully note instructions of section 6 “Assembly” and section 7 “Putting into operation”.

11. Stocking of spare parts, addresses of service centres

Storage of important spare and wearing parts at the site is an essential requirement for operational availability of the coupling.

When ordering spare parts, the following data has to be given:

Number of pieces, name of parts, size (provided it is available, state also drawing-no. and position of spare part on the spare parts list)

If coupling parts are required with finish bore and balanced, specify the following:

Finish bore, fit, keyway and balancing quality

Example of an order: 1 pc. ARPEX M-hub, series ARP, size 214-6
with bore 100 H7 and keyway according to DIN 6885-1
single part dynamically balanced G 2.5 - after keywaying,
speed 1000 rpm

1 pc. ARPEX plate pack, series ARP, size 214-6 complete.

We can only guarantee original spare parts supplied by us.

ATTENTION! **We expressly draw client's attention to the fact that spare parts and accessories not supplied by us, have not been checked and released by us. Their assembly and/or use can possibly alter design characteristics negatively and thereby impair the active and/or passive safety. FLENDER excludes any liability and guarantees for any damage which results from the use of non-original spare parts and accessories.**

Please note that for individual components special manufacturing and supply specifications frequently exist and that we always offer spare parts according to the state of technology and latest legal requirements.

11.1 Addresses of service centres

When requesting spare parts or service fitter, contact FLENDER first.

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